The Genus *Kleidotoma* Westwood in Hawaii, with Descriptions of Three New Species (Hymenoptera: Cynipoidea: Eucoilidae).

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ABSTRACT

Taxonomic descriptions and a key are provided for species of the genus *Kleidotoma* Westwood known from Hawaii. Six species are treated, three of which are described as new. Two new species associated with endemic freshwater Ephydridae and Canaceidae are placed in a new subgenus, *Nesokleidotoma*. A third species, *K. (Pentakleidota) swezeyi* Yoshimoto, also may be aquatic and has been collected around brackish littoral ponds containing larvae of *Neoscatella* (Ephydridae). Of the remaining three species, all placed in the nominate subgenus, two have not been associated with aquatic environments and are presumed to be recent immigrants of unknown origin. One of these is described as new, and the second, *K. kraussi* Yoshimoto, was known previously only from Fiji. The third species, *K. bryani* Yoshimoto, previously known only from Hawaii and Palmyra, is here reported from Guam, where it was collected in association with beach seaweed.

Yoshimoto (1962) published the only previous record of the genus *Kleidotoma* Westwood in Hawaii. He described two species based on only three specimens. During the past 25 years, additional specimens of Yoshimoto's species and of four additional species have come to my attention. Two of the latter apparently represent recently established accidental immigrants. However, of much greater biological significance are two species (or possibly species complexes) associated with freshwater stream environments, which were reared from puparia of endemic Hawaiian species of Ephydridae and Canaceidae. One of these aquatic species was observed and illustrated by the late F.X. Williams more than 50 years ago (Williams 1938), but, until now, had not been identified.

Holotypes of new species described here are deposited in the Bernice P. Bishop Museum, Honolulu, Hawaii.

Genus *Kleidotoma* Westwood

Kleidotoma Westwood 1833, Mag. Nat. Hist. 6:494; Dalla Torre and Kieffer 1910, Das Tierreich 24:205; Weld 1952, Cynipoidea (Hym.) 1905-1950:204; Yoshimoto 1962, Pacific Ins. 4:803; Quinlin 1978, Handbook for Ident. British Ins. 8(1b):25.

Type species: *Kleidotoma psiloides* Westwood.

Kleidotoma is of worldwide distribution and contains more than 60 described species. The form and venation of the forewing are distinctive. The majority of species have the apex of the forewing distinctly incised in

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females, but wings may be truncate apically in males and in females of a few species. The radial cell is completely open and the vein which forms the base of the radial cell is short and usually thickened (Fig. 1). In many species the discal setae of the forewings are greatly reduced, often being represented by vestigial setal bases (minute brown dots) over much of the surface, as in *Eucoila* Westwood. In most species the sides of the scutellar disc are distinctly costate or carinulate.

Earlier authors (e.g.: Dalla Torre and Kieffer 1920, Weld 1952) divided *Kleidotoma* into a series of subgenera, based primarily on the number of segments forming the club of the female antenna. The phylogenetic significance of such characters, at the generic level, has been questioned by more recent workers (e.g.: Nordlander 1978). I have utilized subgenera based on antennal characters for the purposes of this paper, although I recognize that a worldwide revision of the entire genus is needed to produce a more satisfactory classification.

The Hawaiian fauna of *Kleidotoma* includes three species which are assigned to the typical subgenus, and which appear to be recent adventives. One possibly endemic or native species was assigned to the subgenus *Pentakleidota* Weld (1951) by Yoshimoto (1962), and two apparently endemic new species are here assigned to a new subgenus, *Nesokleidotoma*. The latter appears to be a relatively distinctive subgroup characterized by the females having elongate legs and antennae, and forewings which are apically truncate or very weakly emarginate and are densely covered with fine setae. These species are unusual in that they are associated with freshwater stream environments.

The hosts of very few *Kleidotoma* species are known with certainty. In Britain, *K. psiloides* has been reared from puparia of *Leptocera* spp. (Sphaeroceridae), and others have been recorded as associated with animal feces or other decaying organic material (Quinlin 1978). Weld (1952:208) listed *K. japonica* Huzimatsu as having been reared from puparia of *Scatella calida* Matsumura (Ephydridae) from a hot spring in Japan. In the United States, *K. oscinidis* (Ashmead) is recorded as a parasite of *Oscinella* sp. (Chloropidae) in wheat stems (Burks 1979). In Hawaii, a presumed immigrant, *K. costata* n. sp., has been reared from cattle dung, and probably is parasitic on larvae of some small coprophagous fly, possibly a species of Sphaeroceridae. *K. (P.) swezeyi* Yoshimoto has been collected in association with brackish water ponds and may be parasitic on larvae of a presumably native ephydrid fly, *Neoscatella sexmaculata* (Cresson). Definite rearing records are available for both of the new species which are described here in the new subgenus *Nesokleidotoma*. *K. (N.) canaceivorus* has been reared from puparia of an endemic canaceid fly, *Procanace constricta* Hardy and Delfinado, collected in a mountain stream on Hawaii Island.[3] *K. (N.) williamsi*

[3]These authors (1980:388-389) reported finding "large numbers of small parasitic wasps (Eucoilinae, Cynipidae) in the same habitat with *Procanace*, *Neoscatella* (Ephydridae), and *Telmatogeton*, (Chironomidae), and, on several occasions, observed aquatic Hymenoptera crawling about on the rocks underwater where larvae and puparia of *Procanace* and *Neoscatella* were abundant."

has been taken in association with larvae and puparia of *Neoscatella* spp. in freshwater streams on Oahu. Williams (1938) reported "figitid" parasites from *Neoscatella* puparia, and figured an adult female, apparently *K. williamsi,* emerging from a *Neoscatella* puparium.

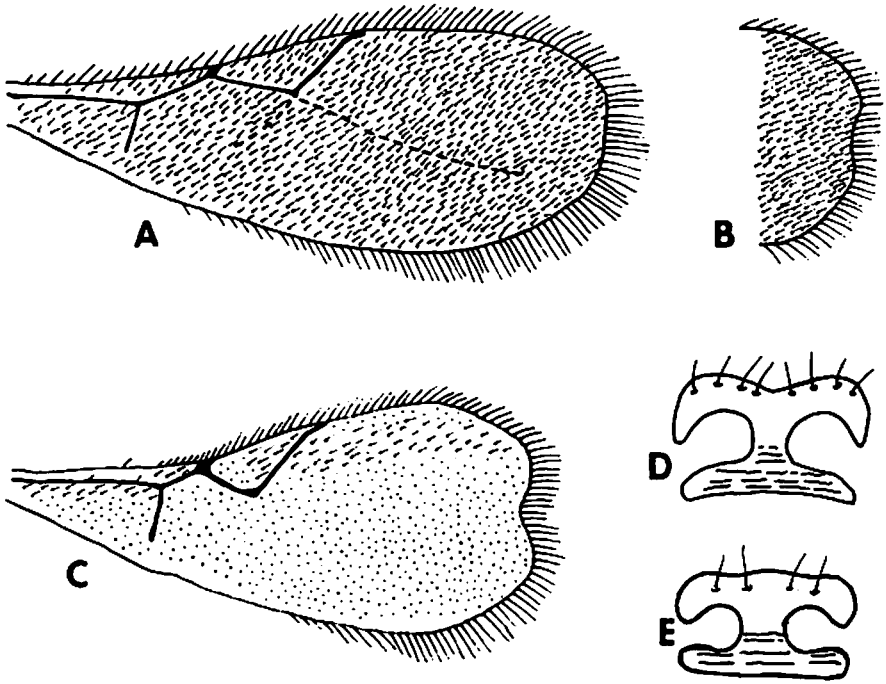

FIGURE 1. A-C, forewings; A, *Kleidotoma williamsi* n. sp.; B, *K. swezeyi* (apex); C, *K. costata* n. sp.; D-E, pronotal places; D, *K. williamsi;* E, *K. canaceivorus* n. sp.

KEY TO HAWAIIAN KLEIDOTOMA

1. Forewing truncate at apex or very slightly emarginate (Fig. 1A), surface densely covered with fine hairs; female legs and antennae relatively long and slender; associated with freshwater environments (Subgenus *Nesokleidotoma)* 2
   Forewing more distinctly emarginate at apex (Fig. 1B, C), surface setae sometimes partly or mostly reduced to vestigial setal bases (minute dots); female legs and antennae often relatively short; associated with terrestrial or brackish water environments 3
2. Scutellar disc distinctly costate laterally (Fig. 6A-B); basal hair ring of gaster well developed, narrowly interrupted mid-dorsally; parasites of *Neoscatella* spp. (Ephydridae) ..... *K. (N.) williamsi,* n. sp.

Scutellar disc smooth laterally, reticulate apically (Fig. 6C-D); hair ring of gaster relatively poorly developed, sparse laterally, broadly interrupted dorsally; parasites of Canaceidae ..... *K. (N.) canaceivorus,* n. sp.

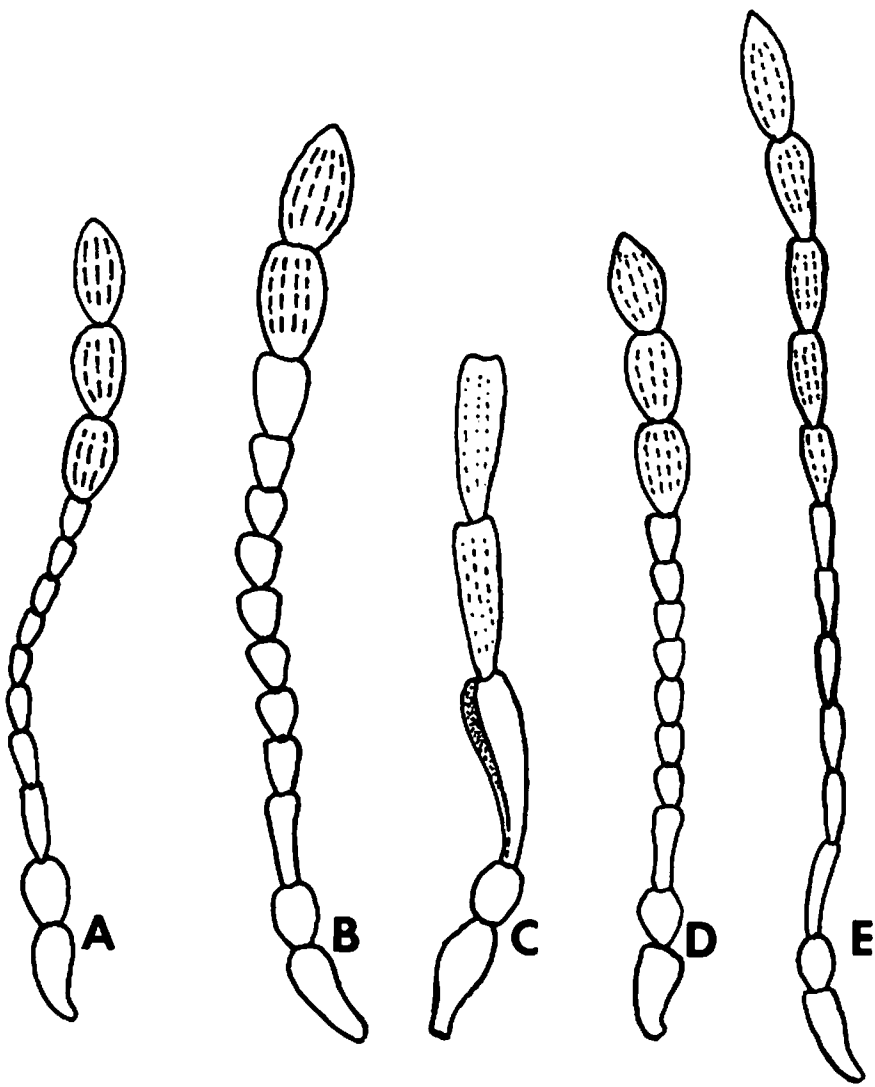

FIGURE 2. Antennae (setae omitted); A, *Kleidotoma bryani* female; B, *K. costata* n. sp., female; C, *K. costata* male, basal segments; D, *K. kraussi* female; E, *K. swezeyi* female.

3. Female antenna with a five-segmented club (Fig. 2E); forewing relatively shallowly emarginate at apex (Fig. 1B); sides of pronotum not costate or striate; associated with brackish water ponds ..... *K. (Pentakleidota) swezeyi* Yoshimoto
   Female antenna with a three-segmented club; forewing more deeply emarginate (Fig. 1C) sides of pronotum sometimes diagonally costate; not known to be associated with brackish water (Subgenus *Kleidotoma*) 4
4. Pronotum not discernibly costate; female antenna relatively elongate, segments 4-8 distinctly longer than wide (Fig. 2A); forewing weakly infumate, fine setae present over most of surface ..... *K. (K.) bryani* Yoshimoto
   Pronotum distinctly costate laterally behind pronotal plate; female antennae relatively short, segments 4-8 at most only slightly longer than wide (Figs. 2B, D); forewing hyaline, discal setae reduced to vestigial setal bases over much of surface 5
5. Head and sides of pronotum relatively strongly costate, area of transverse ridging on head extending onto vertex between lateral ocelli and laterally in area between lateral ocellus and compound eye (Fig. 5A) ..... *K. (K.) costata*, n. sp.
   Head and sides of pronotum less extensively costate, costae of head confined to occipital region ..... *K. (K.) kraussi* Yoshimoto

Subgenus *Kleidotoma* Westwood

Kleidotoma (Kleidotoma) bryani Yoshimoto (Figs. 2A, 3A).

Kleidotoma (Kleidotoma) bryani Yoshimoto 1962, Pacific Ins. 4:803.

The original description of this species was based on two females from Oahu. I have identified two additional females with the following data: Pearl City Peninsula, Oahu, 11•22•1923, E.H. Bryan, Jr., and Waipio Peninsula, Oahu, XI•24•1965, J.W. Beardsley.

There is a series of five specimens, all females, which appear to be this species in the U.S. National Museum collection. These are labelled: Tumon, Guam, III•27•1938, R.G. Oakley, on beach seaweed. Also, Yoshimoto (1963) reported a female specimen from Palmyra Island.

DISTRIBUTION: Hawaii (Oahu), Guam, Palmyra.

HOST: Unknown. The collection records suggest that this is a parasite of some fly which breeds in a littoral environment.

Kleidotoma (Kleidotoma) costata, new species (Figs. 1C, 2B-C, 3C, 5).

Female: Length 1.8 mm (1.3-1.8), forewing 1.7 mm. Color black, legs, antennae, and wing veins dark brown. Head slightly narrower than thorax, length in dorsal aspect about 3/4 width; front between eyes about 2.5 times as wide as compound eye, malar distance measured along malar suture

equal to 2/3 height of compound eye. Occipital area (Fig. 5A) dorsally with strong, arcuate, transverse costae; costate area extending forward on vertex to include region between lateral ocelli, and laterally to area between lateral ocellus and compound eye, weakly indicated as far forward as anterior ocellus. Antenna (Fig. 2B) with distinct three-segmented club; segment 3 about 1.4 times as long as 4; segments 7 to 9 subequal, hardly longer than wide; 10 slightly enlarged; 11 slightly smaller than 12; rhinaria discernible on segments 12 and 13 only.

Pronotal plate moderately large, anterior portion distinctly transversely rugose (Fig. 5A), dorsal margin smoothly arched, dorsal and lateral margins well separated from rest of pronotum by a distinct ridge; pronotal area behind plate on each side with strong diagonal costae (Fig. 5B). Mesoscutum largely smooth, shining, weakly longitudinally striate along lateral margins. Scutellum (Fig. 5C-D) with large basal fossae; lateral bars distinctly costulate; disc from above broad, nearly parallel sided, with a weak lateral lobe on each side, strongly, longitudinally costate laterally, apically very coarsely areolate-rugose. Scutellar plate elongate, extending nearly to apex of disc, smoothly arched with an elongate, narrow anterior neck, posterior portion narrowly tear-shaped with a moderately large subapical pit and a pair of prominent somewhat spatulate setae anteriorly. Mesopleurite smooth, shining, lower portion with a few weak striations along the mesopleural suture. Forewing (Fig. 1C) strongly incised apically, veins strongly pigmented; radial cell (Fig. 3C) about twice as long as wide, second abcissa of radius distinctly longer than first; disc with a few setae in anterior region including radial cell and area between radial cell and apex, setae elsewhere represented by vestigial setal bases (small brown dots). Legs with middle and hind coxae finely, longitudinally strigate on outer surface; forecoxae less noticably so. Gaster with basal hair ring thick and woolly laterally, narrowly interrupted mid-dorsally.

Male: Similar to female except antennae 15-segmented, longer than body, third segment slightly longer than fourth, curved, flattened on outer face (Fig. 2C).

Holotype female: Hawaii I., Kahua Ranch, XI•1970, T. Nishida; ex cow dung. Allotype male, four male paratypes and 10 female paratypes: same date as holotype. Five female paratypes: Hawaii I., Kohala, Koaia Sanctuary, 3000 ft., VII•20•1973, J.W. Beardsley, on *Acacia koaia*. Male paratype: Hawaii I., Mauna Loa Strip Road, 6600 ft. VIII•13•1973. J.W. Beardsley. Female paratype, same data, except V•16•1974.

DISTRIBUTION: Hawaii (Hawaii I.). A presumed immigrant of unknown origin.

HOST: Unknown, presumably larvae of a small species of coprophagous Diptera.

Kleidotoma costata has the integument more distinctly sculptured, particularly the costate areas of the head and pronotum, than either of the two other Hawaiian species which are placed in the typical subgenus. In Quinlin's (1978) key to British *Kleidotoma* it runs closest to *K. striaticollis* Cameron, on the basis of the antennae and the striate pronotum. However,

based on Quinlin's description and figures, it appears to differ from that species in having the pronotal plate larger, with the anterior portion more distinctly rugose. Also, Quinlin makes no mention of striations on the head in *striaticollis,* and the form of the scutellar plate in *costata* appears to be much more slender than that shown for *striaticollis.* The form of the scutellum in *costata* seems to be more like that illustrated by Quinlin for *K. melanopoda* Cameron than for that of *striaticollis.* Based on descriptions, *K. costata* appears to be distinct from all Ethiopian species treated by Quinlin (1986).

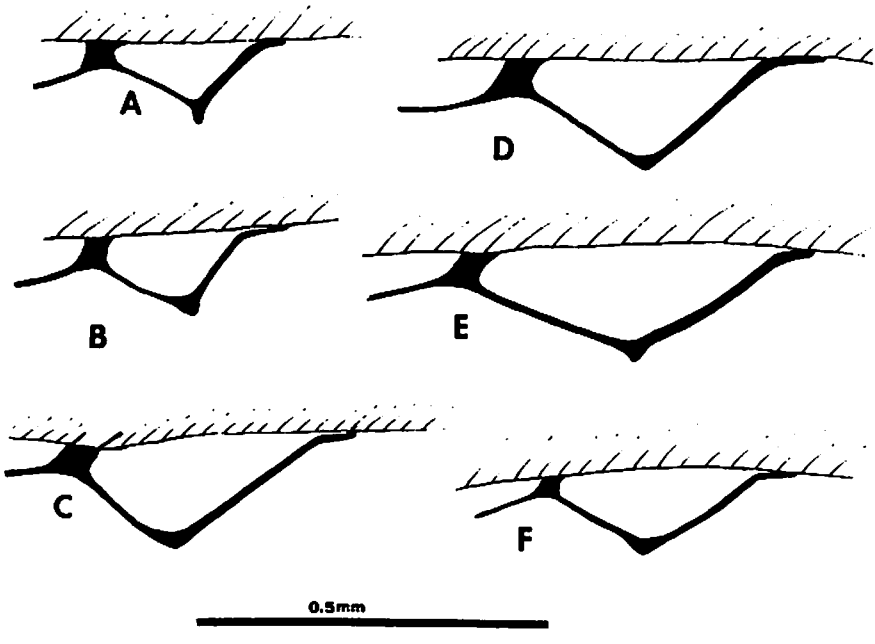

FIGURE 3. Forewing radial cells; A, *K. bryani;* B, *K. kraussi;* C, *K. costata* n. sp.; D, *K. swezeyi;* E, *K. williamsi* n. sp.; F, *K. canaceivorus* n. sp.

Kleidotoma (Kleidotoma) kraussi Yoshimoto (Figs. 2D, 3B, 4).

Kleidotoma (Kleidotoma) kraussi Yoshimoto 1963, Pacific Insects 5:434.

Yoshimoto's description was based on a single female from Nandi, Viti Levu, Fiji. Until now, the species has been known only from the holotype. I have examined 21 female specimens from the Hawaiian Islands which, on the basis of direct comparison with the holotype, appear to be this species. The male is still unknown.

Yoshimoto's rather brief description of this species omits several important characters. Some of these features are obscured by glue in the holotype. The following descriptive notes are based on the female specimens now at hand.

Head nearly as wide as thorax, length in dorsal aspect about 7:11 of width, front between eyes about 2.5 times width of compound eye, malar distance along malar suture about 2/3 height of compound eye. Occipital area dorsally with arcuate transverse costae, costate area not extending forward to lateral ocelli, vertex smooth and shining. Antennae (Fig. 2D) with distinct three-segmented club; segment 3 slightly less than twice as long as 4; segments 6 to 10 subequal, a bit longer than wide; segment 10 distinctly smaller than 11, a trifle wider than 9; segments 11 and 12 subequal; rhinaria present on segments 11 to 13.

Pronotal plate with dorsal margin nearly straight mesally, mesal bridge and anterior portion finely transversely striate; dorsal and lateral margins forming a distinct ridge; pronotum behind plate on each side with a series of about 5 costae extending somewhat diagonally to margin of mesoscutum (Fig. 4C), costate area less strongly developed than in *K. costata*, n. sp. Mesoscutum smooth, shining. Scutellum (Figs. 4A-B) with well-developed basal fossae, lateral bars costulate, disc rounded behind, with a weak lateral

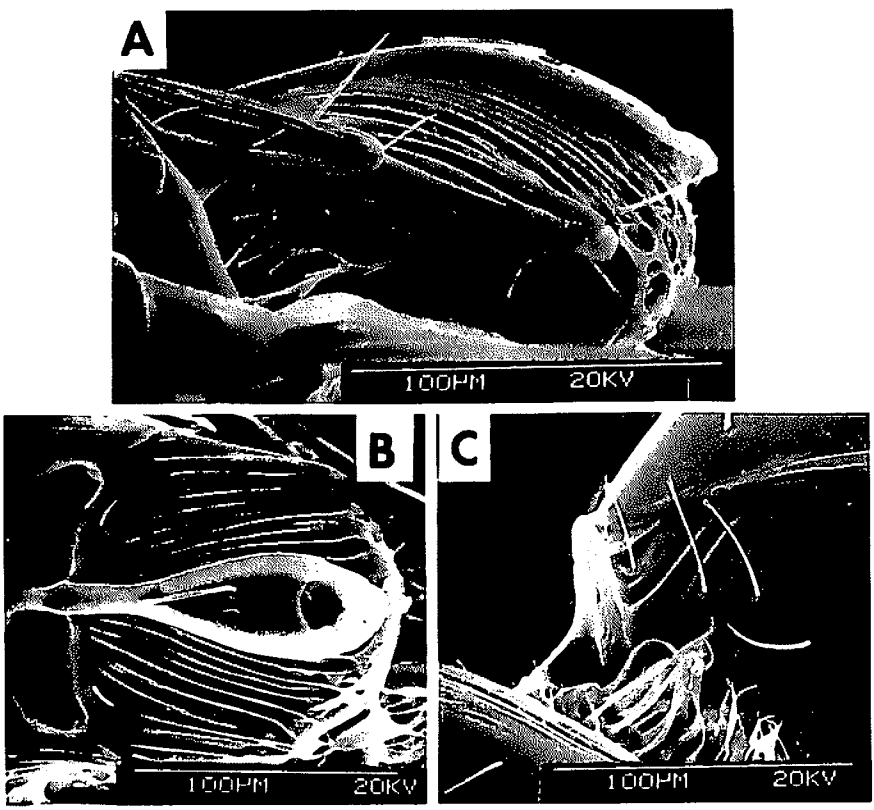

FIGURE 4. *Kleidotoma kraussi;* A, scutellum, lateral view; B, scutellum, dorsal view; C, pronotum, posterior (upper) part, lateral view.

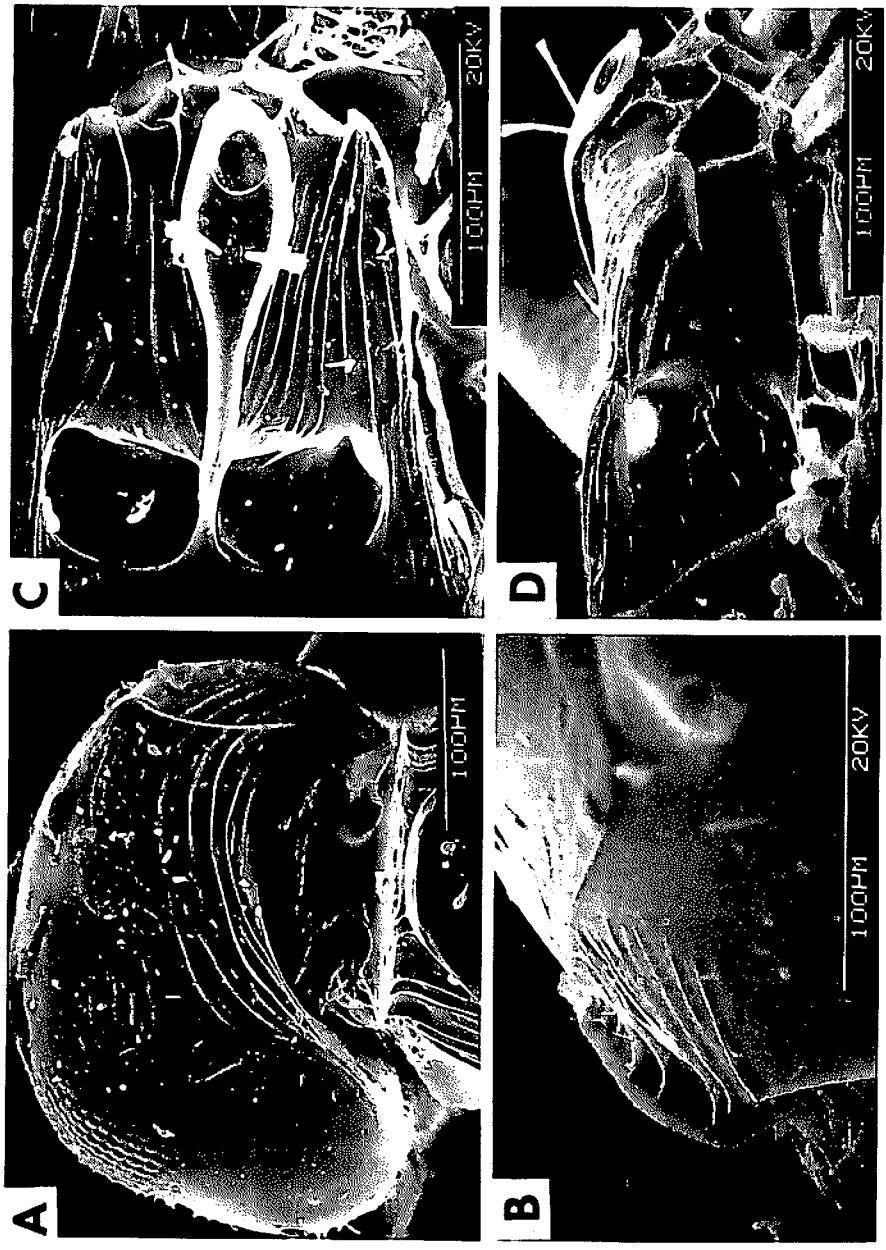

FIGURE 5. *Kleidotoma costata* n. sp.; A, posterior portion of head and pronotum, dorsal view; B, pronotum, posterior (upper) part, from postero-lateral position; C, scutellum, dorsal view; D, scutellum, from postero-lateral position.

lobe on each side, distinctly, longitudinally costate laterally, areolate-rugose apically. Scutellar plate elongate, extending to apex of disc, smoothly arched, anterior neck less elongate than *K. costata,* posterior portion narrowly tear-shaped; subapical pit moderately large; a pair of conspicuous, moderately thick but not spatulate setae anteriorly. Mesopleurite smooth, shining.

Forewing strongly incised apically, veins well pigmented, radial cell (Fig. 3B) rather small, the outer portion of radial vein extending very near the wing margin, so that it appears to extend well beyond the radial cell proper; discal setae vestigial, represented by setal bases. Hind coxae finely, longitudinally striate on outer face, mesocoxae less noticably so. Basal hair ring of gaster thick, woolly, narrowly interrupted dorsally.

Available specimens range from 1.0 to 1.3 mm in length.

DISTRIBUTION: Hawaii (Kauai, Oahu, Lanai, Hawaii), Fiji.

K. kraussi is here recorded for the first time from the islands of Kauai (Kokee, VIII• 1961); Oahu (first taken at Ewa, XI•1965, in light trap); Lanai (Lanaihale, II•1966) and Hawaii (Hilo, X•1976); all collected by J.W. Beardsley.

HOST: Unknown.

Subgenus *Pentakleidota* Weld

Pentakleidota Weld 1951, Proc. Entomol. Soc. Wash. 53:225; Yoshimoto 1962, Pacific Ins. 4:804.

Type species: *Kleidotoma elegans* Cameron.

Kleidotoma (Pentakleidota) swezeyi Yoshimoto (Figs. 1B, 2E, 3D).

Kleidotoma (Pentakleidota) swezeyi Yoshimoto 1962, Pacific Ins. 4:804.

Yoshimoto based his description on a unique female from Koko Head, Oahu. Three additional female specimens with the following collection data have been identified by me: Two, Waialua, Oahu, spring 1936, F.X. Williams, "about briny mud, parasite of *Scatella*?"; one, Hickam Air Force Base, Oahu, II•30•1975, J.W. Beardsley, light trap.

DISTRIBUTION: Hawaii (Oahu), possibly native or endemic.

HOST: Possibly *Neoscatella sexmaculata* (Cresson) (Ephydridae). This is suggested by Williams' specimen label and his mention (1938:107) that "figitid" parasites are often seen around briny mud of maritime swamps in which *N. sexmaculata* larvae occur. *N. sexmaculata* is presumed to be a native species in Hawaii (Hardy and Delfinado 1980:321).

Subgenus *Nesokleidotoma,* **New Subgenus.**

Type species: *Kleidotoma (Nesokleidotoma) williamsi,* new species.

Female: Antennae elongate, 13-segmented, segments from 7 outward each slightly broader than preceding, forming a poorly developed seven-segmented club; segment 3 longer than 4, segments from 3 outward all

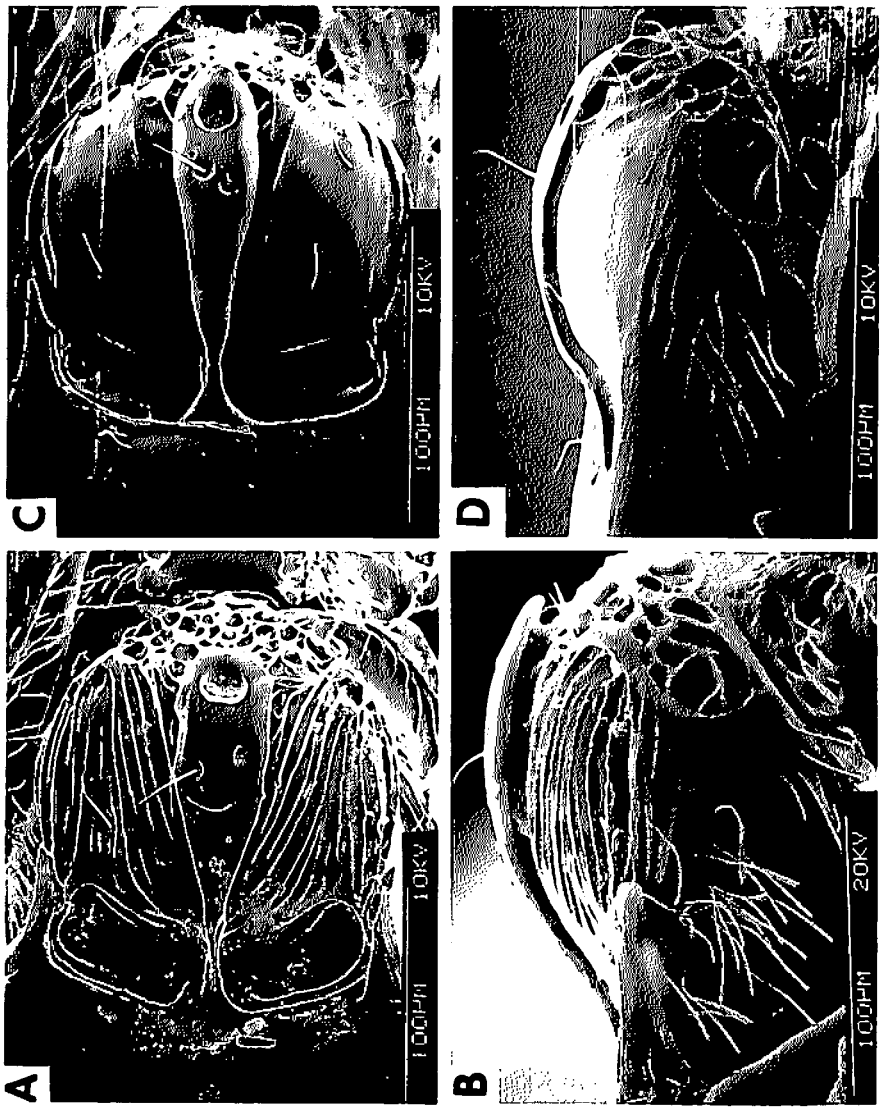

FIGURE 6. *Kleidotoma (Nesokleidotoma)* spp., scutellum; A-B, *K. williamsi*, dorsal and lateral views; C-D, *K. canaceivorus*, dorsal and lateral views.

about three times as long as wide or longer (Fig. 7). Legs elongate. Forewings (Fig. 1A) slightly elongate, weakly infumate, densely pubescent over both surfaces, ciliate on margins, apically truncate or very weakly emarginate; venation typical of *Kleidotoma*, radial cell completely open on margin, the vein forming base of cell short and thick. Mesoscutellum with disc broad, posterior margin rounded or semitruncate from above, sides distinctly costate or nearly smooth; apex weakly to strongly reticulate; scutel-

lar plate narrow, elongate, smoothly arched, tear-shaped with a moderately large subapical pit (Fig. 6). Gaster with basal hair band relatively sparse to moderately dense laterally, interrupted dorsally.

Male: Similar to female except antennae 15-segmented, filiform, third segment longer than fourth, curved, apically expanded, flattened on outer face (Fig. 7).

Nesokleidotoma is erected to accommodate two apparently endemic *Kleidotoma* species which are described below. These species are parasites of freshwater aquatic Diptera larvae in the families Ephydridae and Caenaceidae. They differ from other *Kleidotoma* in having the legs and wings relatively elongate. The wings are densely covered with fine setae and apically truncate or very weakly emarginate, rather than distinctly emarginate, in females as well as males.

Nesokleidotoma species possibly are allied to *K. (Pentakleidota) swezeyi* Yoshimoto. That species is believed to be a parasite of the native ephydrid *Neoscatella sexnotata,* the larvae of which occur in brackish water at or near sea level.

These apparently endemic aquatic or semiaquatic Eucoilidae are presently known only from Oahu and Hawaii islands, but can be expected to occur in streams throughout the Hawaiian Islands, wherever their larval hosts occur. The only other eucoilids reported to be associated with aquatic Diptera larvae appear to be *K. japonica* from Japan, and possibly *K. swezeyi* Yoshimoto in Hawaii. However, the Hawaiian eucoilid fauna contains species in another genus (*Aspidogyrus* Yoshimoto) which are known to be associated with aquatic Diptera. These will be described in a future paper.

It appears that the evolution of Hawaiian *Nesokleidotoma* species may have paralleled that of their ephydrid and canacaeid hosts. In both groups of flies, endemic freshwater species apparently arose from ancestral littoral or estuarian forms (Hardy and Delfinado 1980).

Kleidotoma (Nesokleidotoma) williamsi, new species (Figs. 1A, D, 3E, 6A-B, 7A-B).

Female: Length 1.5 mm (1.4-1.7); forewing 1.8 mm; antenna 1.3 mm. Color black, head and gaster very dark brown, legs and antennae dark brown, wing veins brown, wings slightly infumate. Head slightly narrower than thorax, length in dorsal aspect 5/8 width; front between eyes about 3 times as wide as compound eye; malar space, measured on malar suture, slightly less than 2/3 height of compound eye. Head mostly smooth, shining, with a few longitudinal striations along mesal edge of malar suture, and weakly indicated below antennal bases; occipital region distinctly striate dorsally and laterally. Antenna (Fig. 7A) elongate, with segments from 7 outward each very slightly wider than the preceding, forming a poorly defined seven-segmented club; segment 3 distinctly longer than 4, segments from 3 outward all at least 4 times as long as wide, rhinaria discernible on segments 7 to 13.

Pronotal plate (Fig. 1D) with posterior (dorsal) portion relatively narrow, posterior margin slightly emarginate mesally, mesal bridge relatively

narrow, bridge and anterior portion of plate finely transversely rugose; plate moderately well separated from remainder of pronotum, posterior and lateral margins of posterior part forming a distinct ridge; area of pronotum behind postero-lateral margin of plate with a few ridges extending to margin of scutum; propleurite strongly ridged. Mesoscutum smooth, shining, with weak parapsidal depressions present in posterior third on each side. Scutellar disc (Figs. 6A-B) moderately elevated, rounded behind, distinctly costate laterally with a broad lateral lobe on each side, areolate posteriorly; lateral bars finely striate; basal fossae moderately shallow, surface slightly roughened; scutellar plate elongate, smoothly arched, not reaching apex of disc; narrowly tear-shaped with a moderately large subapical pit and a pair of anterior setigerous pits bearing setae of normal form (Fig. 6A). Mesopleurite smooth, shining, with faint longitudinal striations narrowly paralleling transverse suture, above and below. Forewings (Fig. 1A) relatively long and narrow, densely covered with fine setae on both surfaces; apex very slightly emarginate; radial cell moderately long and narrow; veins Cu and A indicated by slightly darkened depressions. Legs slender, elongate; middle and hind legs about 1.4 times as long as body, with coxae distinctly, longitudinally striate on outer face.

Gaster smooth, shining, longer than high (3:2); posterior tergites exposed at apex; basal hair ring woolly laterally, narrowly interrupted dorsally.

Holotype female: Lulumahu Val., Oahu, X•II•1936, F.X. Williams, "by stream prob. a *Scatella* parasite." Twelve female paratypes, all from Oahu, as follows: Waihi-Iki, VI•30•1936, F.X. Williams, "algae, etc., seeking ephydrids"; Waihi-Iki, Manoa, Honolulu, VII•6-7•1936, F.X. Williams (specimens mounted with *Neoscatella* puparium bearing parasite emergence hole; apparently reared); three, Herring Valley, Tantalus, VI•1933, F.X. Williams, "by water"; Herring Valley, VI•4•1933, F.X. Williams, "wet spot"; two (on one card point), Herring Valley, VIII•20•1933, F.X. Williams, "on wet bank"; three (on one card point), Herring Valley stream, Tantalus, Honolulu, VIII•6•1933, F.X. Williams, "examining soaking algae & diatoms for *Scatella* larvae, stung several in lab"; Herring Valley, Honolulu, 900 ft., VI•29•1936, F.X. Williams, "watery bank where *Scatella* is breeding."

A long series of specimens (35 females, 9 males) was collected by D.E. Hardy and J.A. Tenorio from Honokane Nui Stream, Kohala Mts., Hawaii, during August 1970 and July 1971, from rocks in the stream, apparently in association with *Neoscatella* larvae. These are similar to the type series of *K. williamsi* from Oahu, except for a few minor details (e.g.: the mesopleurite in these specimens is weakly striate just below the wing base, and the parapsidal depressions are less strongly indicated). They are perhaps at least subspecifically distinct. However, additional populations of these aquatic eucoilids need to be sampled before the taxonomic significance of these minor differences can be properly evaluated. The Kohala Mountain specimens are therefore provisionally placed as *K. (N.) williamsi.*

No males of *K. williamsi* from Oahu are available. However, the antennae of male Kohala Mountain specimens differ from those of females as

follows: Antenna 15-segmented, the third segment curved, the outer face flattened and expanded (Fig. 7B), rhinaria present on segments 3 to 15.

This species is named in honor of the late Dr. Francis X. Williams, entomologist and naturalist, who first observed and collected these aquatic eucoilids more than 50 years ago.

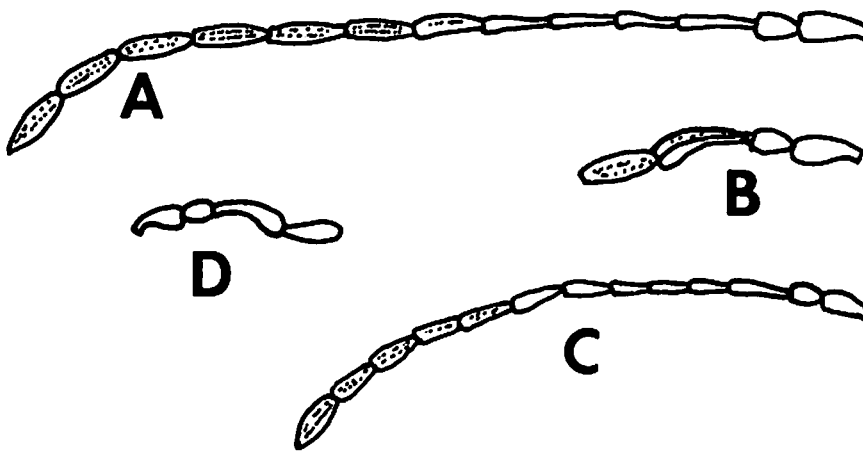

FIGURE 7. *Kleidotoma (Nesokleidotoma)* spp., antennae (setae omitted); A-B, *K. williamsi*, entire female and basal segments of male; C-D, *K. canaceivorus*, entire female and basal segments of male.

Kleidotoma (Nesokleidotoma) canaceivorus, new species (Figs. 1E, 3F, 6C-D, 7C-D).

Female: Length 1.1 mm, (1.0-1.2) forewing 1.3 mm, antenna 0.9 mm. Color black, legs antennae and wing veins dark brown, wings faintly infumate. Head slightly narrower than thorax; length in dorsal aspect 2/3 width; front between eyes about 3 times as wide as compound eye; malar space measured on malar suture about 5/7 height of compound eye. Head smooth, shining throughout, with faint indication of striation in occipital region dorsally. Antenna (Fig. 7C) elongate, segments from 7 outward each very slightly wider than preceding, forming a very poorly defined 7-segmented club, segments from 3 outward all at least 3 times as long as wide; rhinaria discernible on segments 9 to 13.

Pronotal plate (Fig. 1E) with posterior (dorsal) section relatively narrow, as in *williamsi,* posterior margin slightly convex mesally, mesal bridge moderately narrow, dorsal and lateral margins forming a slight ridge, but plate less distinctly separated from pronotum than in *williamsi;* pronotum behind lateral margins of plate with a few short longitudinal ridges weakly indicated on each side; propleurite less strongly ridged than in *williamsi;* mesopleurite smooth, shining. Mesoscutum smooth, shining, parapsidal furrows not developed, scutellum (Figs. 6C-D) not strongly raised, rounded behind, disc smooth, shining laterally, a few longitudinal ridges faintly in-

dicated laterally, reticulate posteriorly; lateral bars faintly striate basally; basal fossae rather shallow, smooth; scutellar plate elongate, smoothly arched, not quite reaching apex of disc, narrowly tear-shaped behind, with a moderately large circular preapical pit plus 2 very small pits anterior to it (Fig. 6C). Legs elongate as in *williamsi*, middle and hind coxae less strongly striate. Wing venation similar to *williamsi*, radial cell (Fig. 3F) slightly smaller and narrower. Gaster smooth, shining, longer than high (4:3); basal hair ring relatively sparse laterally, broadly interrupted dorsally; posterior tergites exposed apically.

Male: Length 0.9 mm. Similar to female except antennae 15-segmented, more elongate (1.3 mm long), filiform, third segment (Fig. 7D) strongly curved, apically expanded, flattened on outer face.

Holotype female: Oahu, Makaha Stream, July-August 1969, collector not indicated, but probably J. Maciolek, reared ex puparia of *Procanace nigriviridis*. Allotype male, one male paratype and one female paratype: same date as holotype.

This material was collected during the period when Dr. John Maciolek of the U.S. Fish and Wildlife Service was surveying the biota of Oahu freshwater streams. Parasitized canaceid puparia collected by him from another locality on Oahu were placed with these specimens. Therefore I believe that these specimens also were probably collected by Maciolek. The identification of the host as *Procanace nigriviridis* Cresson is probably incorrect. Hardy and Delfinado (1980:398) pointed out that specimens from Oahu previously determined as *P. nigriviridis* appear to represent an undescribed species, and that true *nigriviridis* is known only from Kauai.

In addition to the type series, three female specimens from Hawaii Island (Wailuku Stream, 2720 ft., V•27•1971, J.A. Tenorio) are at hand. These are very similar to the type series, but differ in a few details (e.g.: the pronotum is distinctly more striate behind and below the pronotal plate; the mesopleurite is weakly striate anteriorly; etc.). These specimens may be at least subspecifically distinct. However, additional populations of these aquatic eucoilids need to be sampled before these differences can be properly evaluated, and these specimens are here provisionally assigned as *K. (N.) canaceivorus*.

K. canaceivorus can be readily separated from *K. williamsi* by the strongly striate scutellar disc, the more distinctly striate occipital region, and slightly larger size of the latter species.

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